

WHAT IS CLAIMED IS:

1. A dispersion managed optical fiber,
for wavelength division multiplex transmission
networks,

5 the fiber including positive chromatic dispersion
optical fiber portions (T+) alternating longitudinally
with negative chromatic dispersion optical fiber portions
(T-),

the fiber comprising in succession from the center
10 towards the periphery a core having a varying index
profile and then a cladding having a constant index,

the outside radius of the index profile of the
core, which is the limit between the core and the
cladding, being sufficiently small for the optical fiber
15 to function in monomode in-cable,

each optical fiber portion (T+, T-) having at a
wavelength of 1550 nm a chromatic dispersion whose
absolute value is from 1 ps/nm.km to 10 ps/nm.km, a
chromatic dispersion slope whose absolute value is less
20 than 0.015 ps/nm.km, and an effective area greater than
35 μm^2 ,

the relative effective area difference at a
wavelength of 1550 nm between the positive chromatic
dispersion optical fiber portions (T+) and the negative
25 chromatic dispersion optical fiber portions (T-) being
less than 7%, and

each optical fiber portion (T+, T-) having bending
losses at a wavelength of 1625 nm less than 0.1 dB for
100 turns with a diameter of 60 mm.

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2. A dispersion managed optical fiber according to claim
1, characterized in that the average of the outside
radius (r_3) of the index profile of the core, which is
the limit between the core and the cladding, is less than
35 $10.5 \mu\text{m}^2$ in all the optical fiber portions (T+, T-), and
in that the index profile of the core comprises three
slices.

3. A dispersion managed optical fiber according to claim
2, characterized in that the varying index profile of the
core comprises successively, from the center towards the
5 periphery,

a central slice having a maximum index higher than
the index of the cladding,

a buried slice having a minimum index lower than
the index of the cladding, and

10 an annular slice having a maximum index higher than
the index of the cladding and lower than the maximum
index of the central slice.

4. A dispersion managed optical fiber according to claim
15 3, characterized in that the central slice is trapezium-
shaped or alpha-shaped.

5. A dispersion managed optical fiber according to claim
3,

20 characterized in that the average of the difference
(Δn_1) between the maximum index of the central slice and
the index of the cladding is from 7.00×10^{-3} to 11.0×10^{-3} in
all the optical fiber portions (T+, T-),

and in that the average of the radius (r_1) of the
25 portion of the central slice having an index higher than
the index of the cladding is from $2.65 \mu\text{m}$ to $3.70 \mu\text{m}$ in
all the optical fiber portions (T+, T-).

6. A dispersion managed optical fiber according to claim
30 5, characterized in that, for an average portion of
optical fiber whose index profile radius values
correspond to the averages of the radius values of the
index profiles of all the optical fiber portions

(T+, T-), the value of the integral ($S_{01} = \int_0^{r_1} \Delta n(r).dr$) of the

35 index difference relative to the index of the cladding
between a zero radius and the radius (r_1) of the portion

of the central slice having an index higher than the index of the cladding is greater than $23.0 \times 10^{-3} \mu\text{m}$.

7. A dispersion managed optical fiber according to claim 5 6, characterized in that, for an average portion of optical fiber whose index profile radius values correspond to the averages of the radius values of the index profiles of all the optical fiber portions (T+, T-), twice the value ($S_I = 2 \cdot \int_0^{r_1} \Delta n(r) \cdot r \cdot dr$) of the integral
- 10 of the product of the radius and the index difference relative to the index of the cladding between a zero radius and the radius (r_1) of the portion of the central slice having an index higher than the index of the cladding is from $58 \times 10^{-3} \mu\text{m}^2$ to $99 \times 10^{-3} \mu\text{m}^2$.
- 15 8. A dispersion managed optical fiber according to claim 7, characterized in that, for an average portion of optical fiber whose index profile radius values correspond to the averages of the radius values of the index profiles of all the optical fiber portions
- 20 (T+, T-), three times the value ($S_{II} = 3 \cdot \int_0^{r_1} \Delta n(r) \cdot r^2 \cdot dr$) of the integral of the product of the square of the radius and the index difference relative to the index of the cladding between a zero radius and the radius (r_1) of the
- 25 portion of the central slice having an index higher than the index of the cladding is from $150 \times 10^{-3} \mu\text{m}^3$ to $335 \times 10^{-3} \mu\text{m}^3$.
9. A dispersion managed optical fiber according to claim 30 5,
- characterized in that the average of the difference (Δn_2) between the minimum index of the buried slice and the index of the cladding is from -9×10^{-3} and -2.5×10^{-3} over all the optical fiber portions (T+, T-)
- 35 and in that the average of the outside radius (r_2)

of the buried slice is from $4.00\ \mu\text{m}$ to $8.10\ \mu\text{m}$ in all the optical fiber portions (T+, T-).

10. A dispersion managed optical fiber according to claim
 5 9, characterized in that, for an average portion of optical fiber whose index profile radius values correspond to the averages of the radius values of the index profiles of all the optical fiber portions (T+, T-), the value of the integral $(S_{02} = \int_{r_1}^{r_2} \Delta n(r).dr)$ of the
 10 index difference relative to the index of the cladding between the radius (r_1) of the portion of the central slice having an index higher than the index of the cladding and the outside radius (r_2) of the buried slice is from $22.0 \times 10^{-3}\ \mu\text{m}$ to $-8.0 \times 10^{-3}\ \mu\text{m}$.

15 11. A dispersion managed optical fiber according to claim 9,
 characterized in that the average of the difference (Δn_3) between the maximum index of the annular slice and
 20 the index of the cladding is from 0.50×10^{-3} to 7.5×10^{-3} over all the optical fiber portions (T+, T-),
 and in that the average of the outside radius (r_3) of the annular slice is from $6.70\ \mu\text{m}$ to $10.50\ \mu\text{m}$ in all the optical fiber portions (T+, T-).

25 12. A dispersion managed optical fiber according to claim 11, characterized in that, for an average portion of optical fiber whose index profile radius values correspond to the averages of the radius values of the
 30 index profiles of all the optical fiber portions (T+, T-), the value of the integral $(S_{03} = \int_{r_2}^{r_3} \Delta n(r).dr)$ of the
 index difference relative to the index of the cladding between the external radius (r_2) of the buried slice and the external radius (r_3) of the annular slice is from
 35 $1.0 \times 10^{-3}\ \mu\text{m}$ to $15 \times 10^{-3}\ \mu\text{m}$.

13. A dispersion managed optical fiber according to claim 1, characterized in that the average of the outside radius (r_4) of the index profile of the core, which is the limit between the core and the cladding, is less than 16 μm in all the optical fiber portions (T+, T-) and in that the index profile of the core comprises four slices.
14. A dispersion managed optical fiber according to claim 13, characterized in that the varying index profile of the core comprises successively, from the center towards the periphery,
- a central slice having a maximum index higher than the index of the cladding,
 - a first buried slice having a minimum index lower than the index of the cladding,
 - an annular slice having a maximum index higher than the index of the cladding and lower than the maximum index of the central slice, and
 - a second buried slice having a minimum index lower than the index of the cladding.
15. A dispersion managed optical fiber according to claim 14,
- characterized in that the average (T+, T-) of the difference (Δn_1) between the maximum index of the center slice and the index of the cladding is from 7.0×10^{-3} to 10.0×10^{-3} in all the optical fiber portions,
- and in that the average of the radius (r_1) of the portion of the central slice having an index higher than the index of the cladding is from 2.5 μm to 3.5 μm in all the optical fiber portions (T+, T-).
16. A dispersion managed optical fiber according to claim 15,
- characterized in that the average of the difference (Δn_2) between the maximum index of the first buried slice

and the index of the cladding is from -9.0×10^{-3} to -2.5×10^{-3} in all the optical fiber portions (T+, T-),
and in that the average of the outside radius (r_2) of the buried slice is from $4.1 \mu\text{m}$ to $7.0 \mu\text{m}$ in all the
5 optical fiber portions (T+, T-).

17. A dispersion managed optical fiber according to claim 16,

characterized in that the average of the difference
10 (Δn_3) between the maximum index of the annular slice and the index of the cladding is from 0.5×10^{-3} to 5.0×10^{-3} in all the optical fiber portions (T+, T-),

and in that the average of the outside radius (r_3) of the annular slice is from $9.0 \mu\text{m}$ to $13.0 \mu\text{m}$ in all the
15 optical fiber portions (T+, T-).

18. A dispersion managed optical fiber according to claim 17,

characterized in that the average of the difference
20 (Δn_4) between the minimum index of the second buried slice and the index of the cladding is from -9.0×10^{-3} to -2.0×10^{-3} in all the optical fiber portions (T+, T-),

and in that the average of the outside radius (r_4) of the second buried slice is from $12.0 \mu\text{m}$ to $16.0 \mu\text{m}$ in
25 all the optical fiber portions (T+, T-).

19. A dispersion managed optical fiber according to claim 1, characterized in that said dispersion managed optical fiber is obtained by modifying the properties of a single
30 preform.

20. A dispersion managed optical fiber according to claim 1, characterized in that the relative outside radius difference between the positive chromatic dispersion
35 optical fiber portions and the positive negative chromatic dispersion optical fiber portions is made less than 11%.

21. A dispersion managed optical fiber according to claim
1, characterized in that the optical fiber has an
attenuation less than or equal to 0.35 dB/km at a
5 wavelength of 1550 nm.

22. A dispersion managed optical fiber according to claim
1, characterized in that the optical fiber has a
polarization mode dispersion less than or equal to
10 0.2 ps/km^{1/2}, preferably less than or equal to
0.1 ps/km^{1/2}, and even more preferably less than or equal
to 0.05 ps/km^{1/2} at a wavelength of 1550 nm.

23. A dispersion managed optical fiber according to claim
15 1, characterized in that the optical fiber has bending
losses less than 400 dB/m at a wavelength of 1625 nm as
measured for a radius of 10 mm in any of the portions
constituting said optical fiber.